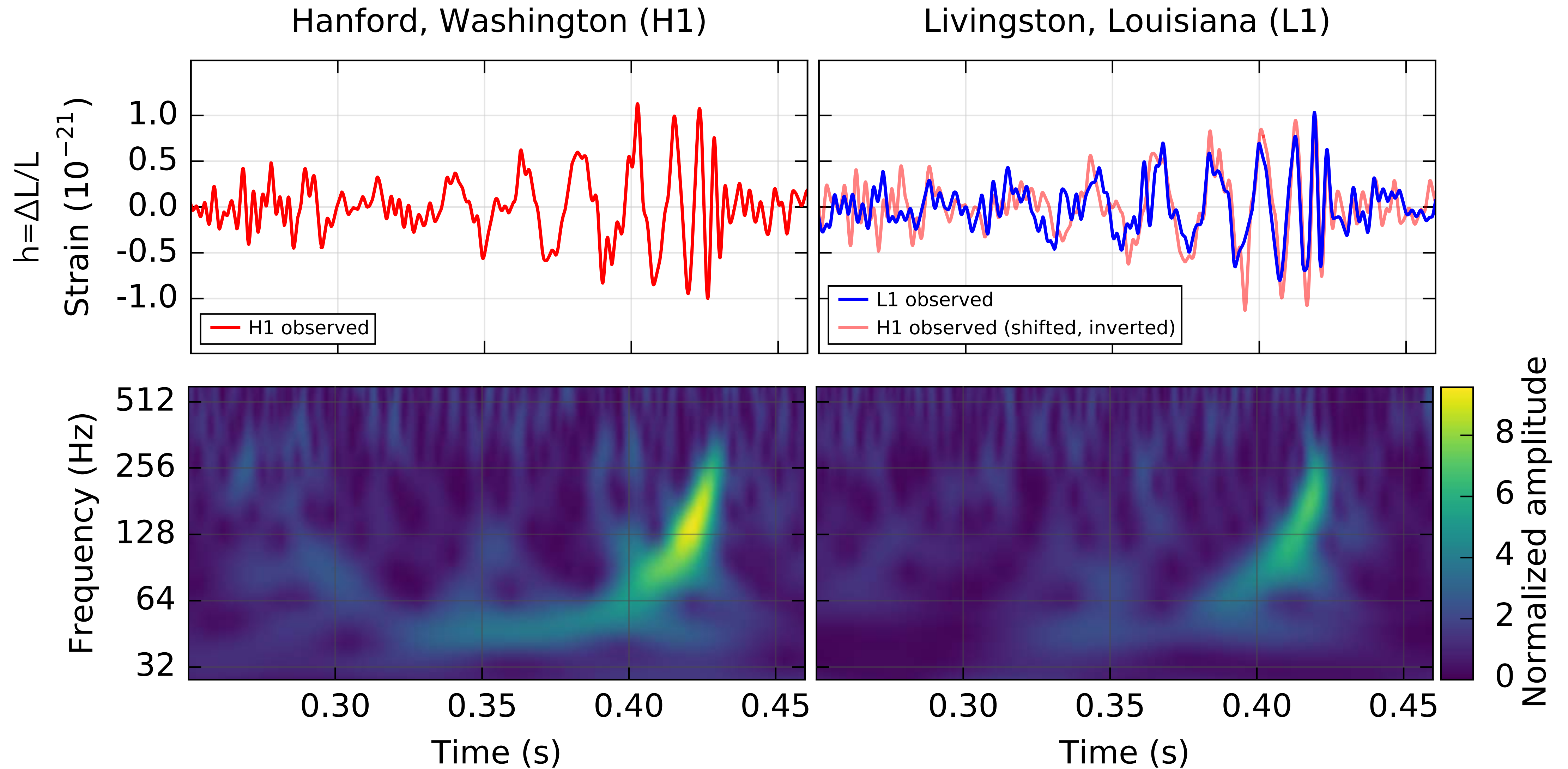


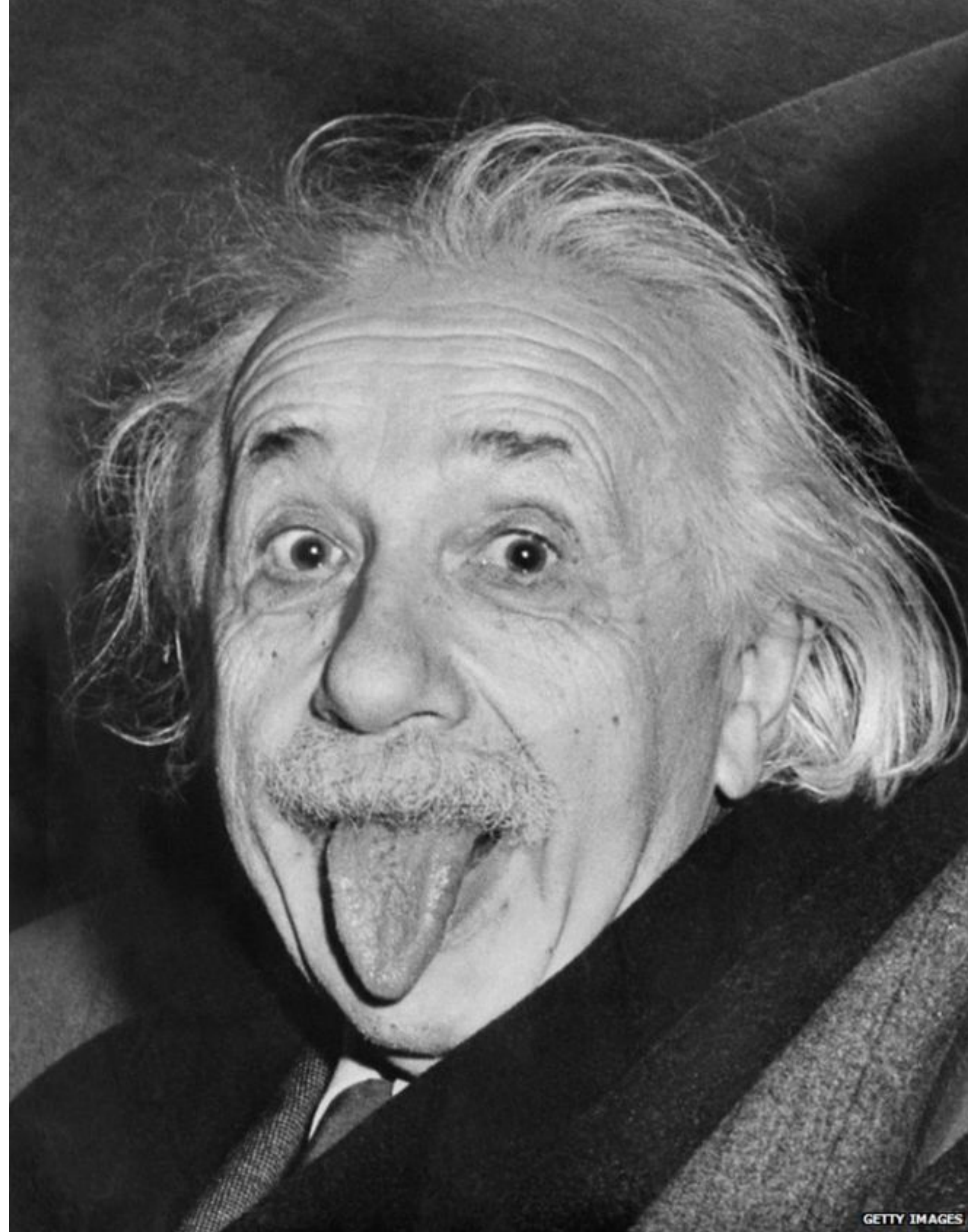


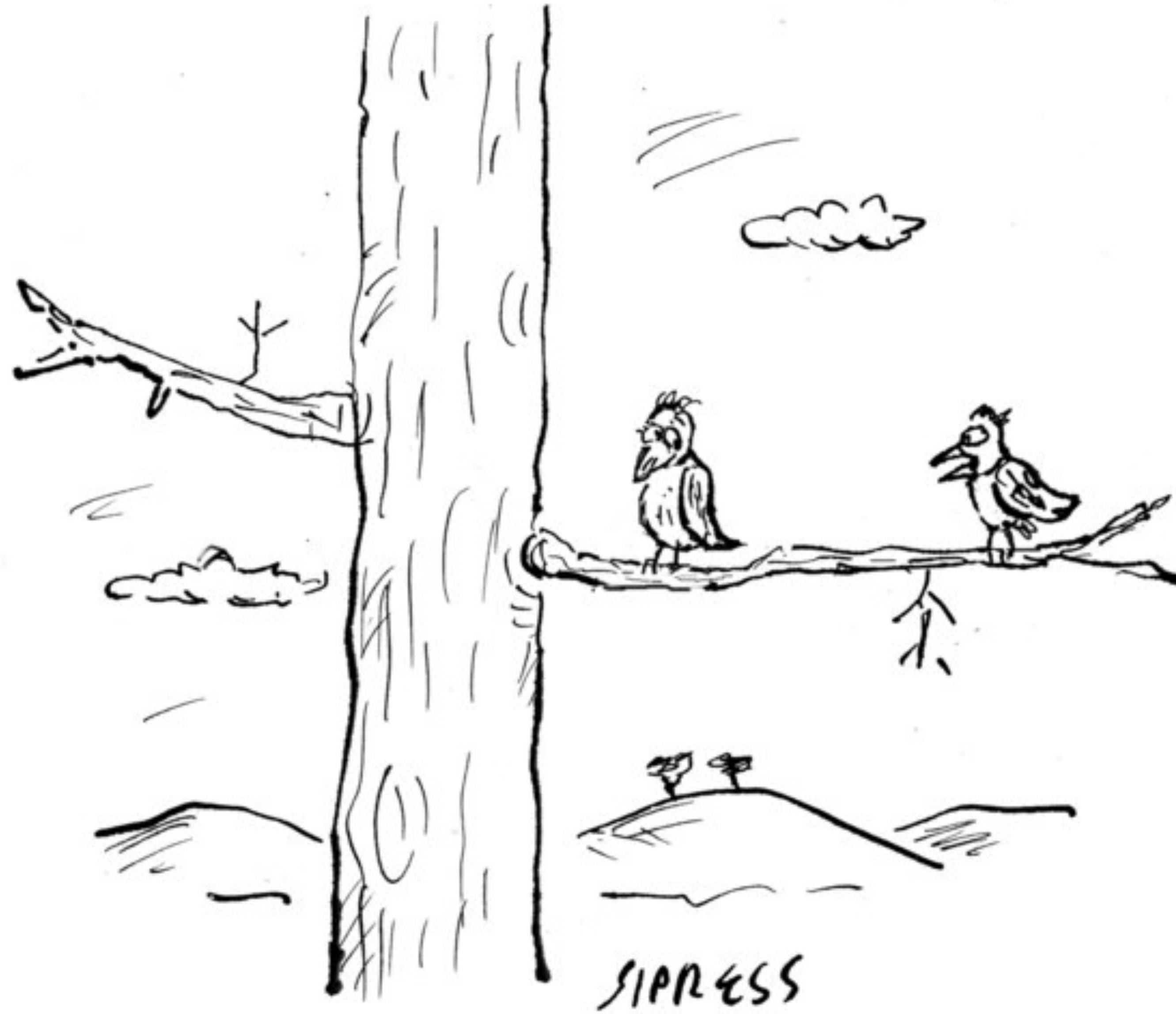
# GW150914 - observed signal



There's another way to do  
astronomy...

Albert Einstein - general relativity (1915)

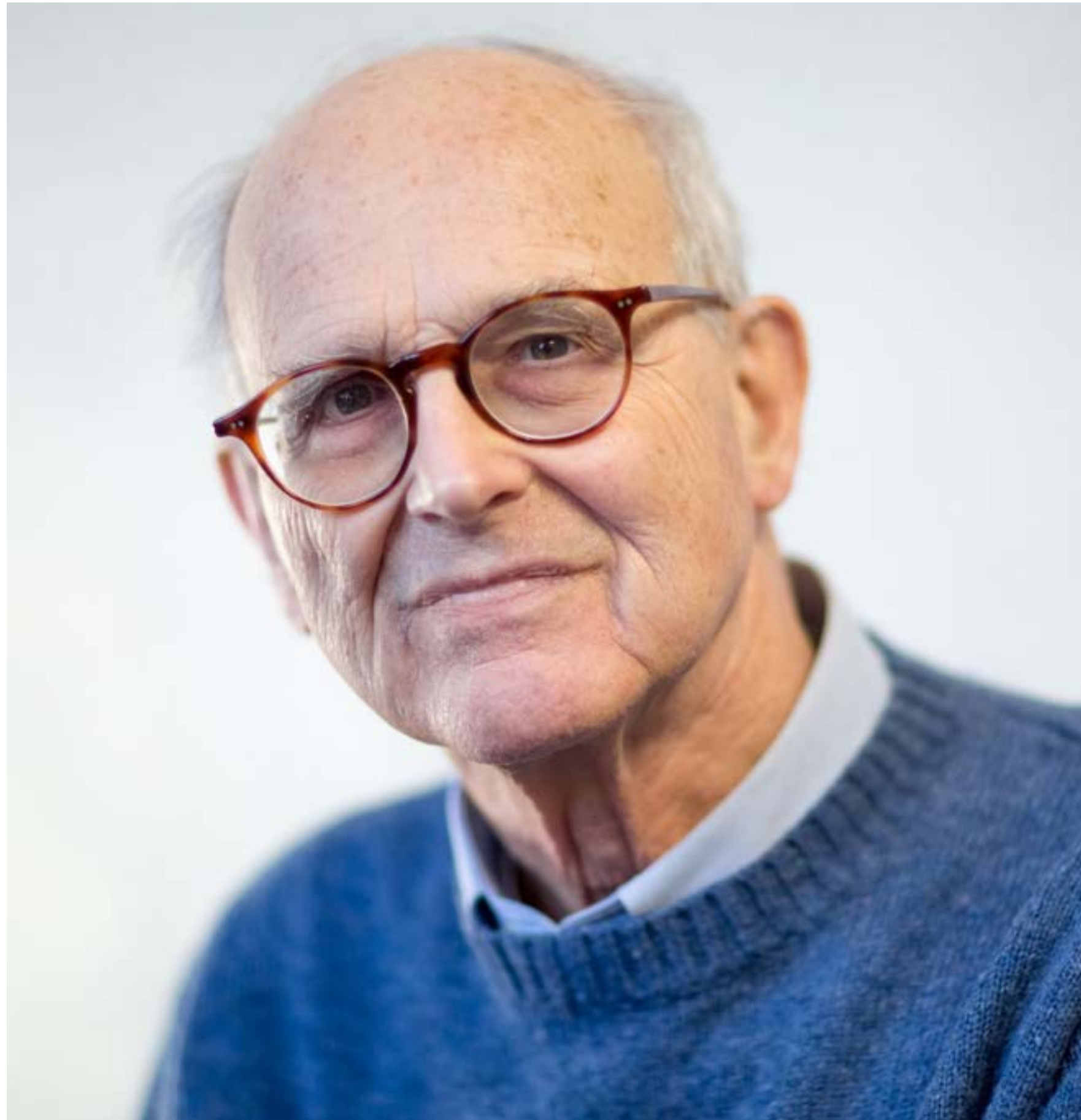




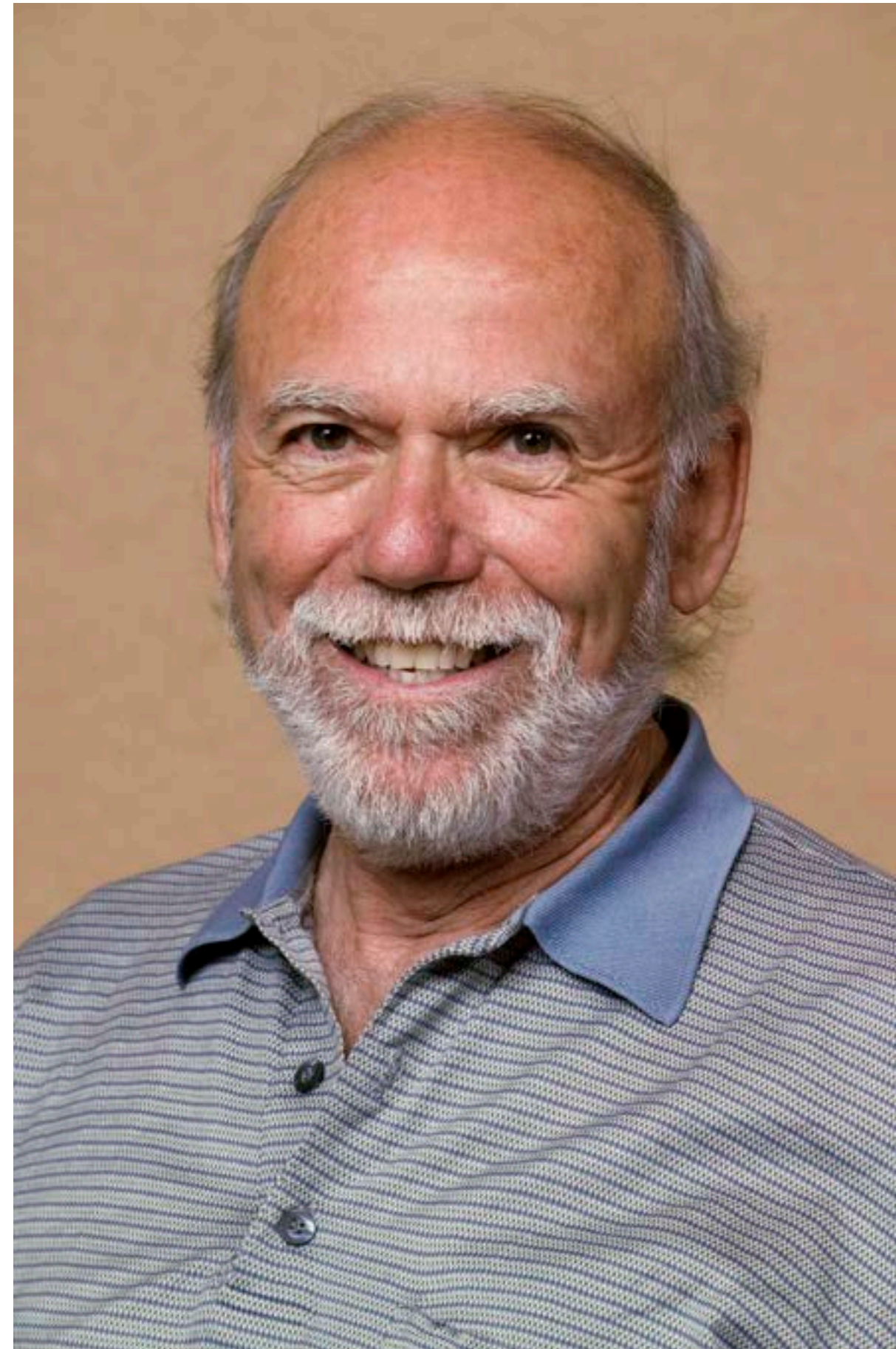
*“Was that you I heard just now or was it two black holes colliding?”*

[New Yorker Magazine]

# 2017 Nobel Prize in Physics



Rai Weiss



Barry Barish



Kip Thorne

“for decisive contributions to the LIGO detector and the observation of gravitational waves”











# 8th Gravitational Wave Astronomy Summer School at South Padre Island, TX

May 28 - June 8



The program will consist of a two-week intensive course in four different areas of gravitational wave astronomy:

- Astrophysics of gravitational wave sources
- Introduction to General Relativity
- Gravitational wave detector instrumentation
- Gravitational wave data analysis

Application Deadline: March 19, 2012

## Instructors:

Teviet Creighton (UTB)  
Joe Romano (UTB)  
Peter Saulson (Syracuse University)  
Peter Shawhan (University of Maryland)

Contact: Robert Stone  
Tel: (956) 882 6655  
Email: [infophysics@utb.edu](mailto:infophysics@utb.edu)

<http://phys.utb.edu/outreach/gwasummer2012>

University of Texas at Brownsville  
Center for Gravitational Wave Astronomy  
80 Fort Brown, Brownsville, Texas 78520

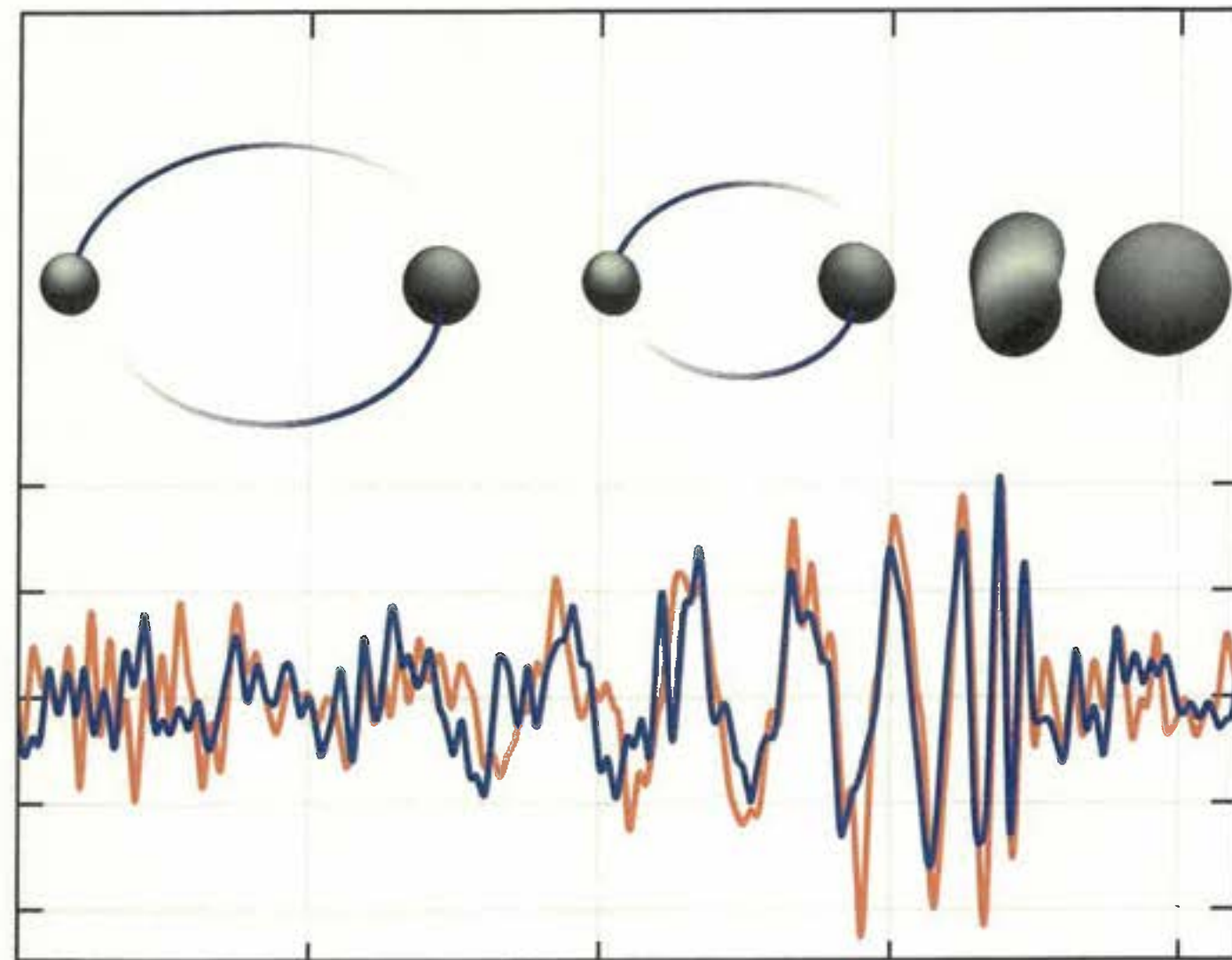






# PHYSICAL REVIEW LETTERS™

Articles published week ending 12 FEBRUARY 2016



Published by  
American Physical Society™



Volume 116, Number 6

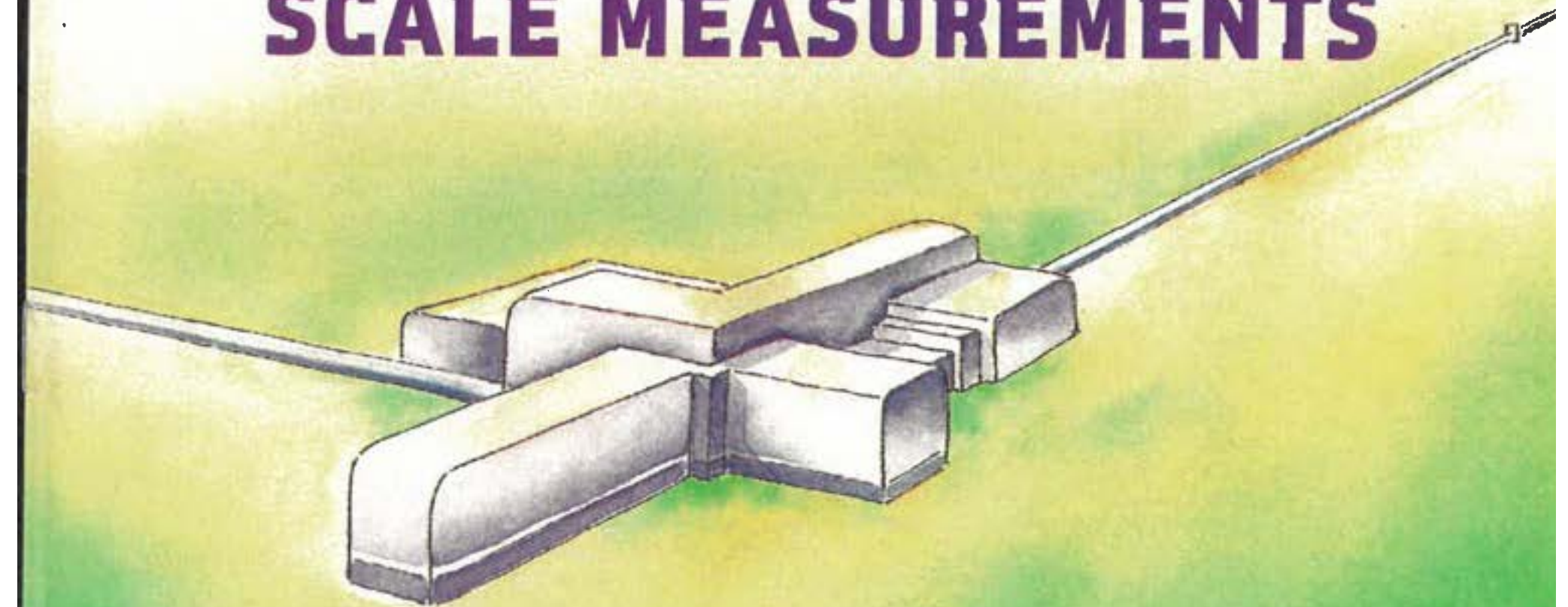
AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

17 APRIL 1992  
VOL. 256 • PAGES 281-412

\$6.00

## LARGE SCALE MEASUREMENTS



# LIGO MAGAZINE issue 8 3/2016



## LIGO Scientific Collaboration News



Gaby (Gabriela) González  
LSC spokesperson

A handwritten signature in black ink that reads "G. González".

September 14, 2015 marks the end of a long journey and the beginning of a new adventure. On that day, a feeble ripple of space time was turned into a visible (and audible!) signal by our LIGO detectors, two of the most incredible devices ever built by humankind. That ripple of space time briefly crossing paths with Earth after a billion year long voyage through the depths of space brought us GW150914, the first ever direct detection of a gravitational wave. GW150914 brings to a conclusion the long journey to directly detect gravita-

tional waves. It also opens the way to a new adventure: gravitational-wave astronomy.

Since 2008, when Advanced LIGO was funded, many people were involved in installation and commissioning to make the Advanced LIGO detectors a reality - this was hard work, invisible to most people outside the LIGO detectors, but of course the heart of the discovery. Since 2010, the LSC has been not only analyzing initial LIGO and Virgo data, but also tuning search codes to make the best of the Advanced LIGO detec-





## RIOT IN PRISON

A brawl between rival drug gangs at an overcrowded penitentiary in northern Mexico turned into a riot Thursday, leaving 49 inmates dead and 12 injured in the country's deadliest prison melee in years.

> PAGE B3

## SPORTS



## SEASONED PLAYERS

The Falcons have brought back a solid battle-tested group to the field this year that is led by some standout seniors. They include center midfielder Ivan Jimenez, central defender Juan Lopez, goalkeeper Jorge Medina and forwards Eric Avila and Gaston Olmedo.

> PAGE B1

## LOCAL



## SAFER CROSSINGS

Bayou Drive, one of the most popular thoroughfares at Laguna Atascosa National Wildlife Refuge, will temporarily close beginning in March for road construction that will make crossing much safer for coots.

> PAGE A2

## OBITUARIES

Narciso Gonzalo Cavazos Jr.  
Rene Alberto Ramos  
Jose Armando Gonzalez  
Maria Yolanda Contreras  
Hernandez/Garcia-Espinosa

> PAGE A4

## POPULAR ON THE WEB

**UPGRADES**  
The Brownsville Public Library System is several steps closer to receiving 359 new Dell computers for both library branches this year.  
[BrownsvilleHerald.com](http://BrownsvilleHerald.com)

Vol. 124 | No. 224

Good Morning!  
Thank you for reading today's edition of The Brownsville Herald



# EINSTEIN CORRECT

UTRGV physicists help observe gravitational waves



PHOTO BY BRAD BOWEN/THE BROWNSVILLE HERALD

Above and below: University of Texas Rio Grande Valley faculty staff and students listen to a web simulcast Thursday about the detection of gravitational waves at facilities in Louisiana and Washington.

BY DANIEL A. FLORES  
STAFF WRITER

With a little help from UTRGV, scientists have detected gravitational waves, ripples through the fabric of spacetime, experimentally verifying Albert Einstein's last prediction of general relativity made a century ago. Months of social media rumors were confirmed during a Thursday news conference, introducing a new way to observe the universe.

University of Texas Rio Grande Valley physicist, some who've worked decades on the project, are among more than 1,000 international collaborators with the Laser Interferometer Gravitational-wave Observatory (LIGO). The Brownsville-based research center has been home to more than 20 authors of a paper published Feb. 11 by the peer-reviewed Physical Review Letters. "It takes a lot of people to do this," said Gabriela Gonzalez, spokeswoman for the LIGO scientific



PHOTO BY DANIEL A. FLORES/THE BROWNSVILLE HERALD

collaboration, during the news conference. Last September, LIGO completed an upgrade to its pair of gravitational-wave detectors located near Livingston, Louisiana, and Hanford, California.

PLEASE SEE WAVES, A5

## Former LIGO director reflects on historic wave detection

BY STEVE CLARK  
STAFF WRITER

Mark W. Cole was floored when he got the news in mid-September that the Laser Interferometer Gravitational Wave Observatory (LIGO) had detected gravitational waves just a few days earlier.

"Like, wow," he said. "That was it." Cole, a National Science Foundation senior advisor and LIGO program officer, was head of the Louisiana facility in the early 2000s. He characterized the recent achievement as historic and the mood joyful.

PLEASE SEE LIGO, A5

## Zapata family suing bank

Lawsuit: Lack of measures to halt laundering

BY LAURA B. MARTINEZ  
STAFF WRITER

The family of slain U.S. Immigration and Customs Enforcement Special Agent Jaime J. Zapata — and other victims of alleged terrorist attacks in Mexico — have filed a federal lawsuit against HSBC Holdings Inc., claiming the bank laundered billions of dollars for Mexican drug cartels.

The lawsuit alleges the drug cartels used the laundered money to fund terrorist acts that included the attack on Zapata and several other U.S. citizens in Mexico. "HSBC's systematic and prolonged support in providing financial services and laundering billions of dollars of drug proceeds for the Sinaloa, Juarez, Los Zetas and Norte del Valle cartels proximately caused the attacks on the Victims and the injuries to Plaintiffs, including the Victims' estates, survivors and heirs," the lawsuit states.

Zapata, 32, a Brownsville native who worked for U.S. Immigration and Customs Enforcement, was killed Feb. 15, 2011, on a highway near San Luis Potosi, Mexico, in an attack by members of the Zetas drug cartel. His ICE partner, Victor Avila, was wounded in the attack.

Authorities said Zapata struggled with his associates as they tried to drag him out of his vehicle. Zapata was shot at least three times with the bullets flying through the car window that accidentally had been cracked open. Authorities said 100 spent casings from AK-47 bullets were found at the scene.

According to the lawsuit, some of the last words Zapata uttered were, "I am going to die." The other victims listed in the lawsuit are Lesley Enriquez Redelfs, an employee of the U.S. Consulate Office in Ciudad Juarez, and her husband, Arthur Redelfs, a detention

PLEASE SEE SUIT, A5

# UT-RGV physicists played role in breakthrough discovery

By Bruce Selcraig, Staff Writer | February 11, 2016 | Updated: February 12, 2016 12:26am

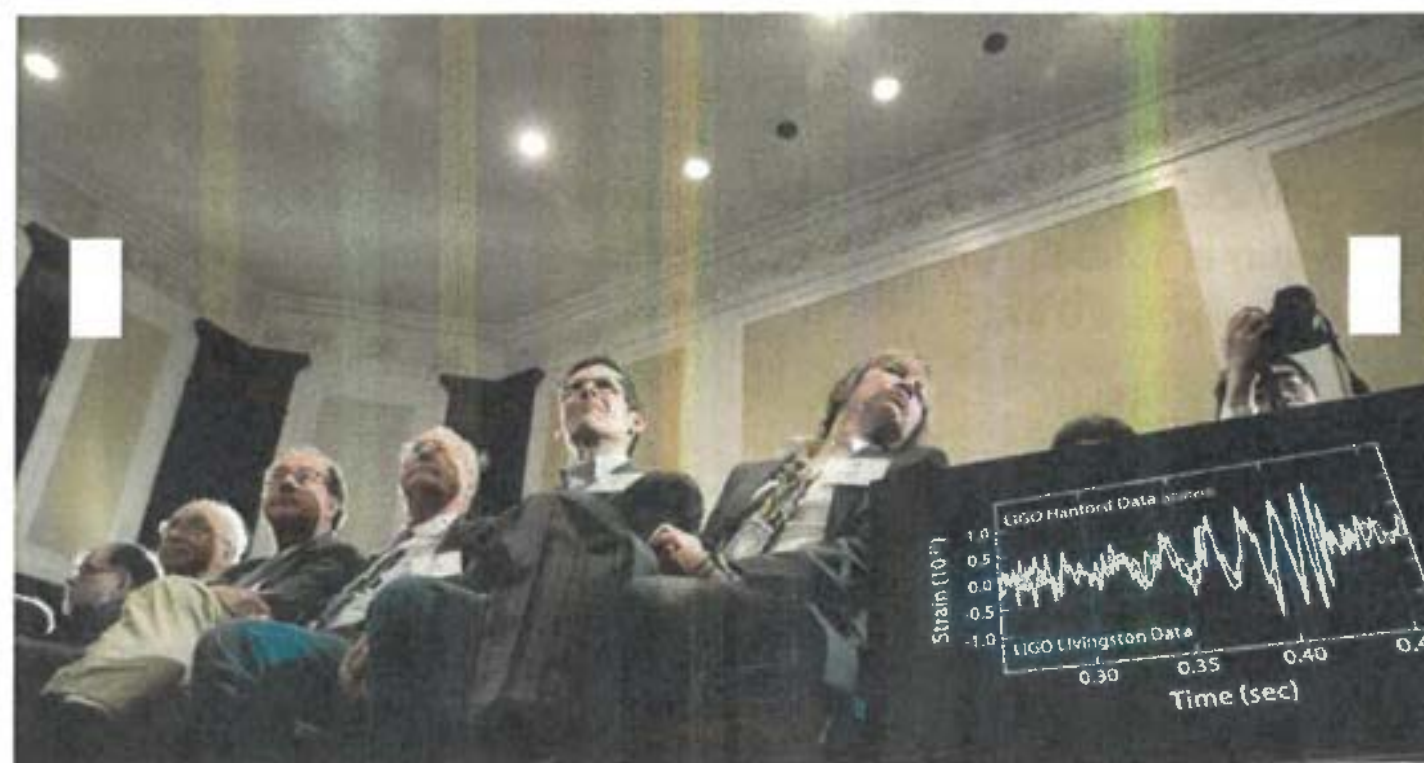


PHOTO BY DANIEL A. FLORES/THE BROWNSVILLE HERALD

Keynote speaker The McHenry speaks on accountability for Texas public schools at a Brownsville Independent School District town hall meeting Thursday morning in Brownsville.

BY DANIEL A. FLORES/THE BROWNSVILLE HERALD

San Antonio Express-News  
Only \$1 per Week / All Digital Access  
Save Today  
ExpressNews.com | eEdition | iPad app

Local

The University of Texas Rio Grande Valley

# RIPPLES

## Newsletter

A Center for Gravitational Wave Astronomy Publication

### Gravitational Waves Detected 100 Years after Einstein's Prediction

SUMMER RESEARCH  
Want to get in on some astronomical action?

STUDENT PROFILE  
Learn about how UTRGV Ph.D. student, Karla Ramirez, and her thermal noise research earned her a spot on the LIGO Team.

RESEARCH HIGHLIGHTS  
Check out the 2015 research highlights that paved the way to this amazing discovery.

UPCOMING EVENTS  
See how you can participate in some exciting science based events in 2016.

ISSUE 6  
SPRING 2016

## Educational accountability discussed in Brownsville

BY GARY LOHN  
STAFF WRITER

There was little disagreement among educators at a meeting Thursday in Brownsville. "Focus" system of public school student assessment and accountability needs improvement, educators said. At a town hall meeting sponsored by District 2 State Board of Education member Ruben Cortez of Brownsville and the Brownsville Independent School District, there was a general consensus that the state's current

regimen of accountability tests puts special needs students at a disadvantage. The meeting was one of nine "community conversations" being held across the state by the Next Generation Commission on Assessments and Accountability. The meetings are part of the roll out of House Bill 2804, the measure that requires Texas' accountability system to move to an A to F rating system beginning with



PHOTO BY DANIEL A. FLORES/THE BROWNSVILLE HERALD

PLEASE SEE HALL, A5

Abby	B6	Calendar	B7	Community	B7	Sports	B7
Amusements	C2	Classified	A6	Education	B6	Weather	B8
Business	C1	Comics	B5	Horoscope	B6	High 80°	Low 53°

FOR IMMEDIATE RELEASE

# Gravitational Waves Detected 100 Years after Einstein's Prediction

- ❖ *LIGO Opens New Window on the Universe with Observation of Gravitational Waves from Colliding Black Holes*
- ❖ *UTRGV's CGWA Scientists Contribute with Nearly 20 Years of Gravitational Wave Research*

WASHINGTON, D.C. / RIO GRANDE VALLEY, TEXAS – FEB. 11, 2016 – For the first time, scientists have observed ripples in the fabric of spacetime called gravitational waves, arriving at the earth from a cataclysmic event in the distant universe.

This confirms a major prediction of [Albert Einstein's 1915 general theory of relativity](#), and opens an unprecedented new window onto the cosmos.

Gravitational waves carry information about their dramatic origins and about the nature of gravity that cannot otherwise be obtained. Physicists have concluded that the detected gravitational waves were produced during the final fraction of a second of the merger of two black holes to produce a single, more massive spinning black hole. This collision of two black holes had been predicted, but never observed.

The gravitational waves were detected at 5:51 a.m. (EDT) on Sept. 14, 2015, by both of the twin [Laser Interferometer Gravitational-wave Observatory](#) (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington. The LIGO Observatories are funded by the National Science Foundation (NSF), and were conceived, built and are operated by Caltech and MIT.

The discovery, accepted for publication in the journal *Physical Review Letters*, was made by the LIGO Scientific Collaboration (which includes the GEO Collaboration and the Australian Consortium for Interferometric Gravitational Astronomy) and the [Virgo Collaboration](#), using data from the two LIGO detectors.

Monday, February 15, 2016



# THE RIDER

THE STUDENT VOICE OF THE UNIVERSITY OF TEXAS RIO GRANDE VALLEY

**Sports:**  
WAC indoor championships approaching




Vol. I, Issue 19

## Police to meet with prosecutors in slap case

**Jesus Sanchez**  
EDITOR IN CHIEF

**U**niversity Police will meet with prosecutors from the Edinburg Municipal Court this week to discuss the case which a UTRGV professor allegedly slapped a student last month, officials say. We've interviewed various students about [the case]," RGV Police Chief Raul Anguila said. "... From our perspective, it still looks like it's a class misdemeanor. We will be meeting with the prosecutors at the municipal court just to get another opinion." On Jan. 21, a student on the Edinburg campus reported that a philosophy class was having a discussion about right and wrong and while the discussion was taking place, the professor

## Groundbreaking discovery

Gravitational waves confirmed, will help map universe

**Oscar Castillo**  
THE RIDER

**S**cientists announced Thursday that gravitational waves do exist, calling it a "fundamental science discovery." "Ladies and gentlemen, we have detected--gravitational waves. We did it," David Reitze, LIGO Laboratory executive director, told a roaring crowd during a news conference that was live streamed in the Student Union's Gran Salón in Brownsville. The UTRGV Center for Gravitational Wave Astronomy (CGWA), a member of LIGO, streamed the conference from the National Press Club in Washington, D.C., where Reitze announced the existence of gravitational waves, which were observed Sept. 14 by the two Laser Interferometer Gravitational-wave Observatories (LIGO). During the presentation, Reitze compared the discovery to Galileo's work, which started the era of modern observational



MARIO GONZALEZ/THE RIDER

# In Memory of Dr. Cristina Torres



▲ Dr. Cristina Torres and members of the Society of Physics Students after a Physics Circus community outreach event.





HAPPIER WITH LIFE

From their relationships to their jobs to their money — even from the time they first roll out of bed — young white Americans are happier with life than their minority counterparts.

► PAGE A7

SCIENCE



DEJA VU

Even as the wounded space shuttle Endeavour brought its seven astronauts safely home Tuesday, NASA is looking ahead to three more launches at risk for the same kind of damage.

The 315-inch-long gouge in Endeavour's belly did not put the astronauts at risk. And as soon as the damaged tiles are popped off, engineers will know whether repairs are needed to the underlying aluminum structure. The gouge seemed to weather the return flight well, NASA said.

But for the early part of Endeavour's 13-day mission there was an eerie sense of deja vu.

EDUCATION

TOOLS FOR TEACHING

Incarmate Ward Academy has upgraded from chalkboard to SMART Board. Now, thanks to the new technology, teachers have various multimedia tools at their disposal that can enrich class time, parents and teachers say.

► PAGE C1

SPORTS

VELA FUNERAL

Parking was scarce, and open seats in the pews and balcony were nonexistent Tuesday morning for those who arrived less than 30 minutes before local football coaching legend Robert Vela's funeral at Sacred Heart Catholic Church.

► PAGE B1

OBITUARIES

Benedicta Ybarra Librada Benavides Raul Sergio Suarez Emile G. Champion Ramon G. Rosales

► PAGE A6

MOST VIEWED ON THE WEB

- Dean headed south
► Valley's reprieve
► Caught on tape

BrownsvilleHerald.com

Vol. 116 | No. 47

Good Morning! Thank you for reading today's edition of The Brownsville Herald



► YATES CASE: LAWYERS' HE SAID, HE SAID HEATS UP IN YATES CASE, AS DEFENSE MOVES TO DISQUALIFY DISTRICT ATTORNEY, PAGE A2

The Brownsville Herald

WEDNESDAY, AUGUST 22, 2007 BORN ON THE FOURTH OF JULY 1892 50 CENTS

Hurricane Dean slams into Mexico

BY MARK STEVENSON THE ASSOCIATED PRESS

FELIPE CARRILLO PUERTO, Mexico — Hurricane Dean slammed into the Caribbean coast of Mexico on Tuesday as a roaring Category 5 hurricane, the most intense Atlantic storm to make landfall in two decades. It lashed remote Mayan villages as it raced across the Yucatan Peninsula to the heart of Mexico's oil industry.

along a sparsely populated coastline, well to the south of the major resorts where 50,000 tourists had been evacuated.

It weakened to a Category 1 storm, with maximum sustained winds of 85 mph, but was expected to grow back into a powerful hurricane as it draws fuel from the warm waters of the lower Gulf of Mexico, where more than 100 offshore oil platforms were evacuated ahead of the storm.

Dean's path was a stroke of luck for Mexico: After killing 13 people in the Caribbean, it made landfall

along a sparsely populated coastline, well to the south of the major resorts where 50,000 tourists had been evacuated. It weakened to a Category 1 storm, with maximum sustained winds of 85 mph, but was expected to grow back into a powerful hurricane as it draws fuel from the warm waters of the lower Gulf of Mexico, where more than 100 offshore oil platforms were evacuated ahead of the storm.



A ripped up tree is seen Tuesday in a street in downtown Chetumal, southeastern Mexico in the Yucatan peninsula.

THE ASSOCIATED PRESS

EYES ON THE SKY



Mario Diaz, and Physics and Engineering students, Antonio Galan, Boris Torres and Guillermo Valdes, work on the University of Texas at Brownsville and Texas Southmost College Observatory, Tuesday. The work began in June. Officials do not yet have an estimated completion date.

BRAD DOHERTY THE BROWNSVILLE HERALD

Allstate ordered to ditch rate increase

BY ELIZABETH PIERSON HERNANDEZ THE BROWNSVILLE HERALD

AUSTIN — The Texas insurance commissioner on Tuesday ordered Allstate not to implement a homeowner's rate increase the company had announced the day before.

The Commissioner also said Allstate will have to receive prior approval from the Texas Department of Insurance before it raises rates in the future. On Monday Allstate filed notice with the Texas Department of Insurance that it would raise rates by 5.9 percent, effective immediately, for the 917,000 homeowners that buy its policies in Texas. The increase would appear as customers receive their renewal notices, the company said.

Rad Bordelon, Office of Public Insurance Counsel

On top of that, customers statewide would have to pay another 2 percent increase, on average, for the company's reinsurance costs, with coastal residents paying the most and those inland paying less, said Bill Mellander, spokesman for Allstate.

PLEASE SEE ALLSTATE, A12

Group sued for selling fake citizenship documents

BY ANDRES R. MARTINEZ THE MONITOR

EDINBURG — The Texas attorney general sued an Edinburg pastor and two others in connection with a company that promised people U.S. citizenship if they bought a fake tribal citizenship certificate for \$400.

"We have not seen a case like this, so brazen"

Tom Kelley, spokesman for Texas Attorney General Greg Abbott

"We have not seen a case like this, so brazen," said Tom Kelley, a spokesman for the attorney general. The civil lawsuit alleges that Edinburg pastor Victor Ramirez worked as a representative of Kaweah Indian Nation Inc., a company based out of Wichita, Kan.

Ramirez charged legal residents and immigrants in the Rio Grande Valley up to \$400 as a representative of Grand Chief Thunderbird IV, also known as Malcolm Webber of Kansas, according to the suit. Webber and Ralph Tipton of San Antonio were also sued. They promised those who bought the certificates automatic U.S. citizenship, according to the suit. The alleged scam was based on a law that grants U.S. citizenship to members of federally recognized tribes. The Kaweah group was denied official recognition as a tribe by the federal Bureau of Indian Affairs in 1984. Webber could not be contacted late Tuesday. The investigation began after the Texas Civil Rights Project forwarded complaints about the com-

pany to the attorney general's office about two months ago, Kelley said. It was unclear how many people were defrauded, Kelley said.

According to a letter on the Project's Web site, there have been reports that Kaweah sold certificates in Georgia and California and that it charged as much as \$1,400. The attorney general's office is investigating whether any other pastors or intermediaries sold the certificates knowing they could not grant anyone U.S. citizenship, let alone tribal citizenship.

PLEASE SEE FRAUD, A12

EYES ON THE SKY



Mario Diaz, and Physics and Engineering students, Antonio Galan, Boris Torres and Guillermo Valdes, work on the University of Texas at Brownsville and Texas Southmost College Observatory, Tuesday. The work began in June. Officials do not yet have an estimated completion date.

BRAD DOHERTY THE BROWNSVILLE HERALD





**Guillermo Valdes**

sept 30, 2010 · 👤

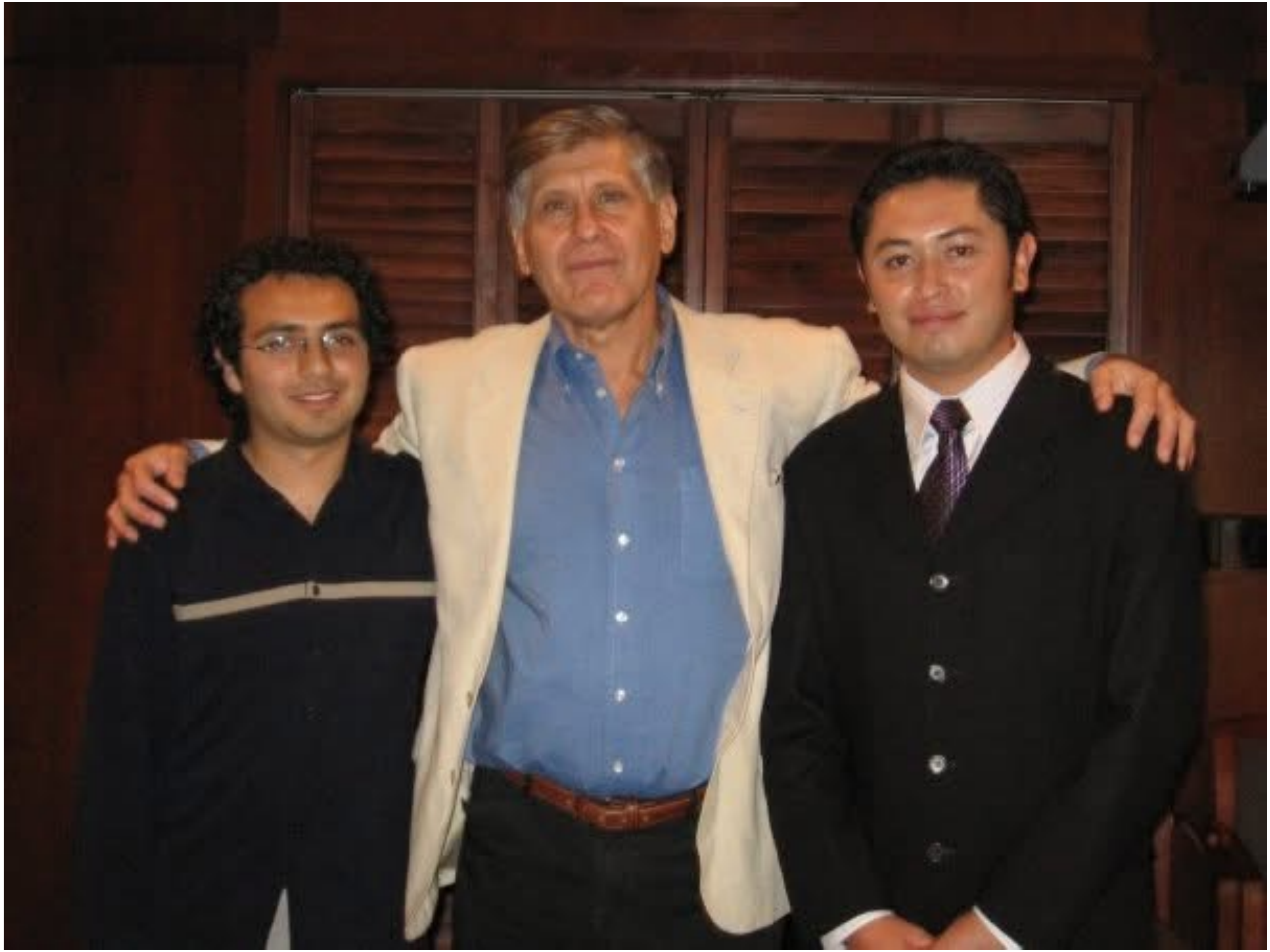
El observatorio Nompuewenu



**Antonio Galán**

dic 11, 2012 · 🌐

**Con Guillermo Valdes y Jose Figueroa Garcia.**







Guillermo Valdes en LIGO Livingston Observatory

nov 11, 2015 · 🌐



**Guillermo Valdes**

may 13, 2016 · 🌐

With Dr. Taylor, Nobel Prize in Physics (1993).







CAPÍTULO 04

## Ondas Gravitacionales

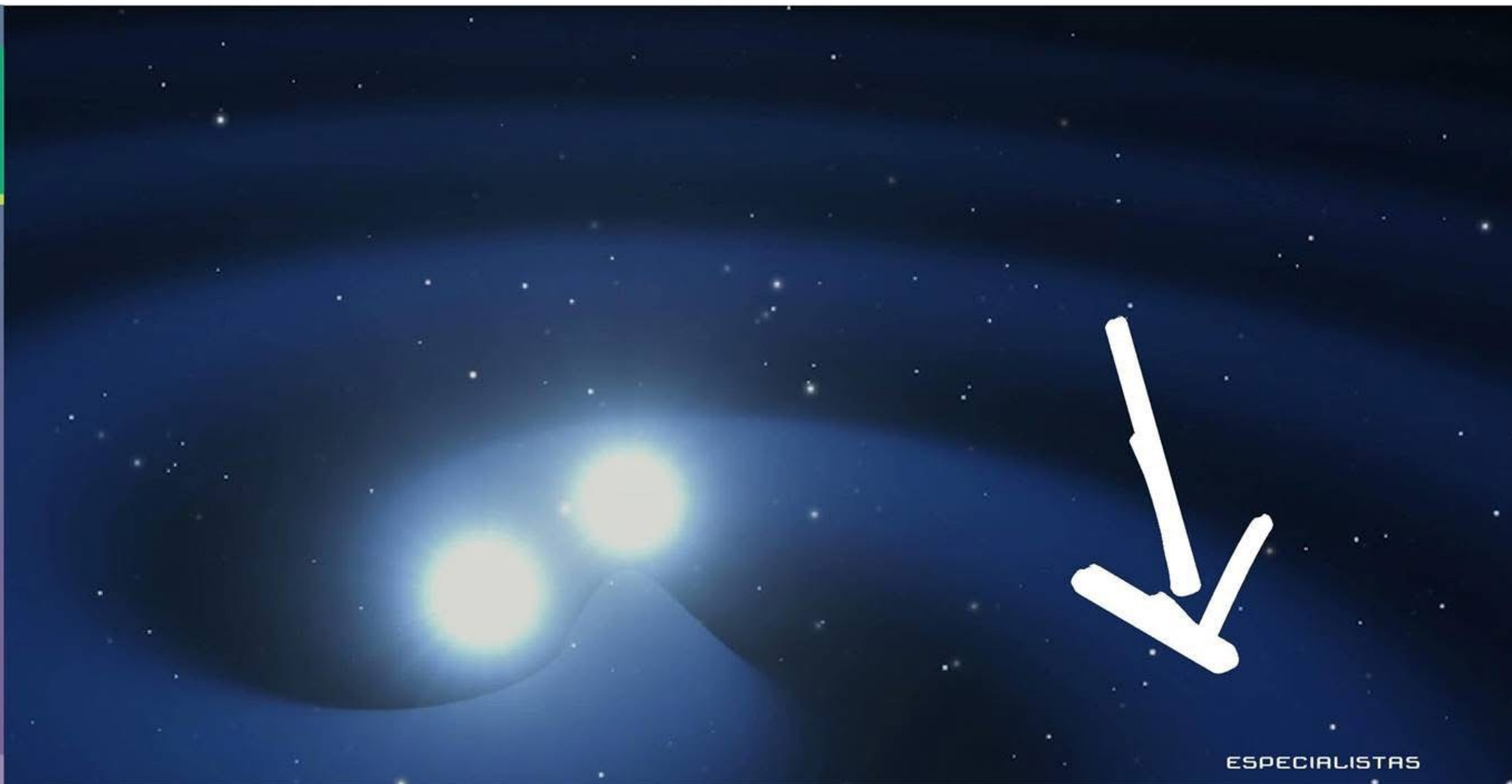
Realizador: Felipe Bracho  
Narrado por: Diana Bracho

**JULIO 2018**

**lunes 02, 21:35 h**

**sábado 07, 20:00 h**

<http://www.canalcatorce.tv>



ESPECIALISTAS



**DR. CARLOS FRENK**  
Director del Instituto de  
Cosmología Computacional  
de la Universidad de Durham



**DR. MIGUEL ALCUBIERRE**  
Director del Instituto de  
Investigaciones Nucleares  
UNAM



**DR. LUIS FELIPE RODRÍGUEZ**  
Investigador Emérito de la UNAM,  
Investigador del Instituto de  
Radioastronomía y Astrofísica



**DR. WILLIAM LEE**  
Coordinador de la Investigación  
Científica - UNAM



**DR. GUILLERMO VALDÉS**  
Investigador Posdoctoral del  
Departamento de Física y Astronomía  
Universidad de Louisiana - LIGO

**Cobertura:** Canal 14.1 de Televisión digital terrestre

**Sistema de Paga:** Sky 114, 1114 HD, iZZi 14, Totalplay 14, Axtel 14, Megacable 114 y Dish 114







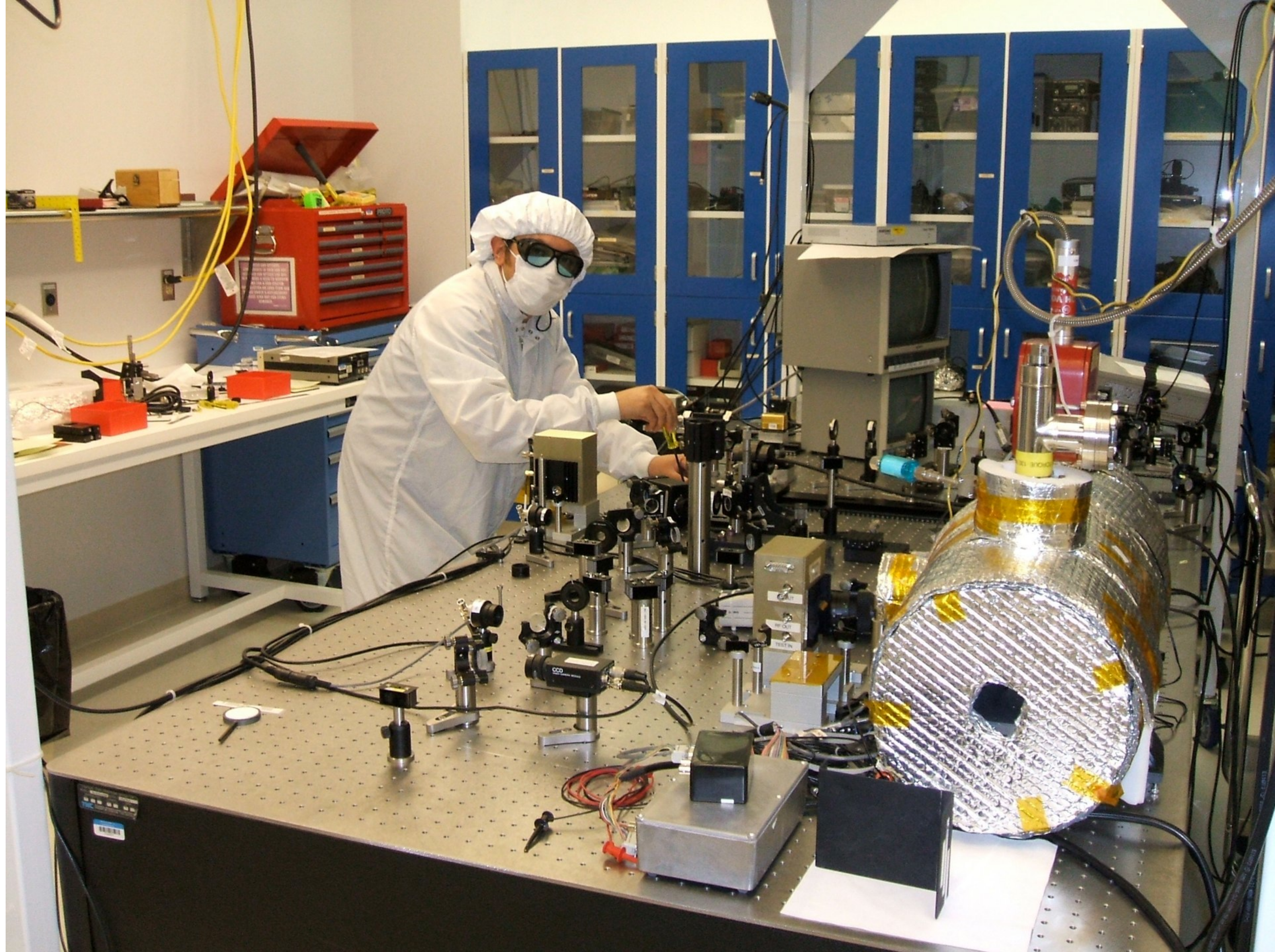


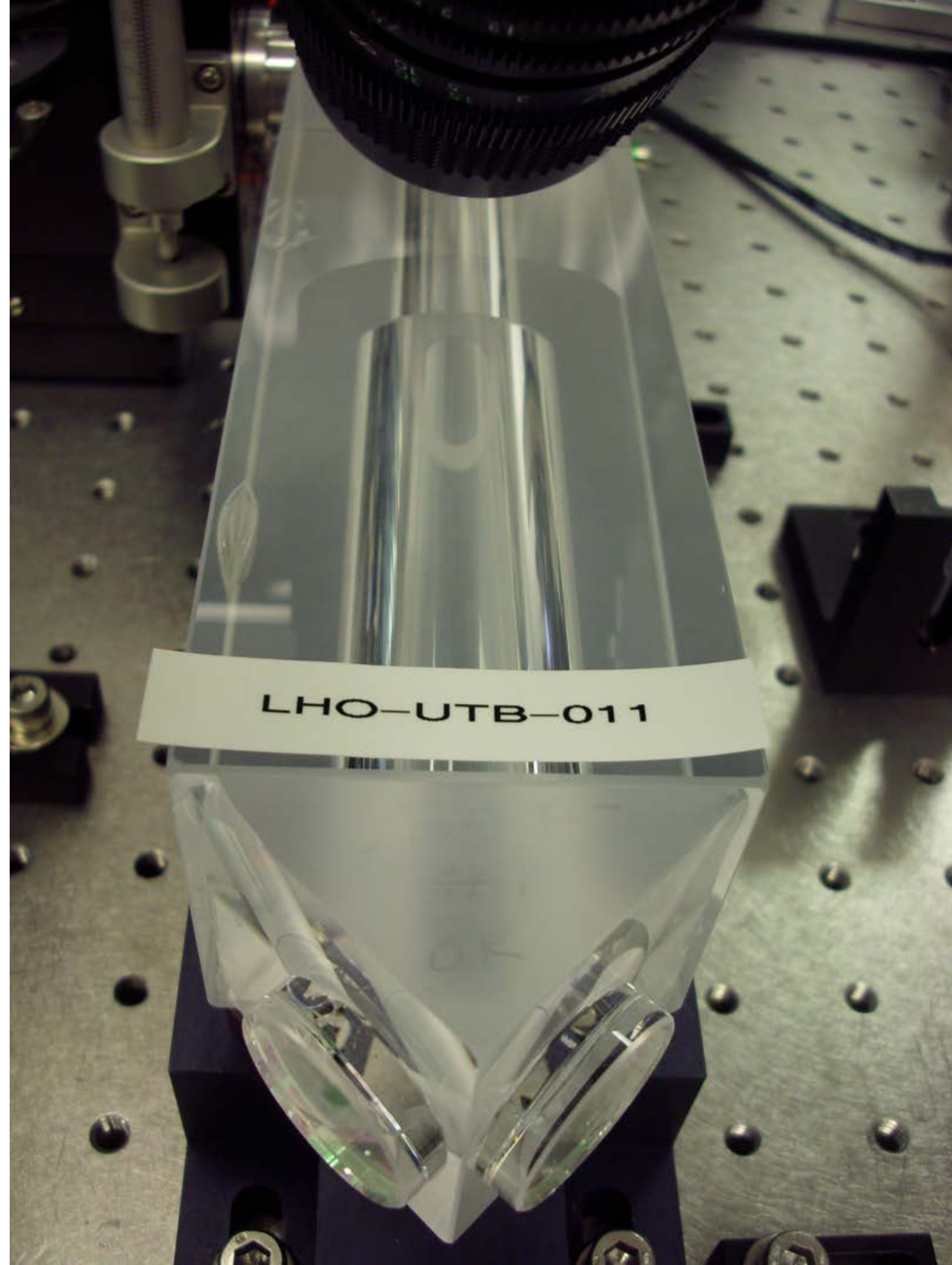


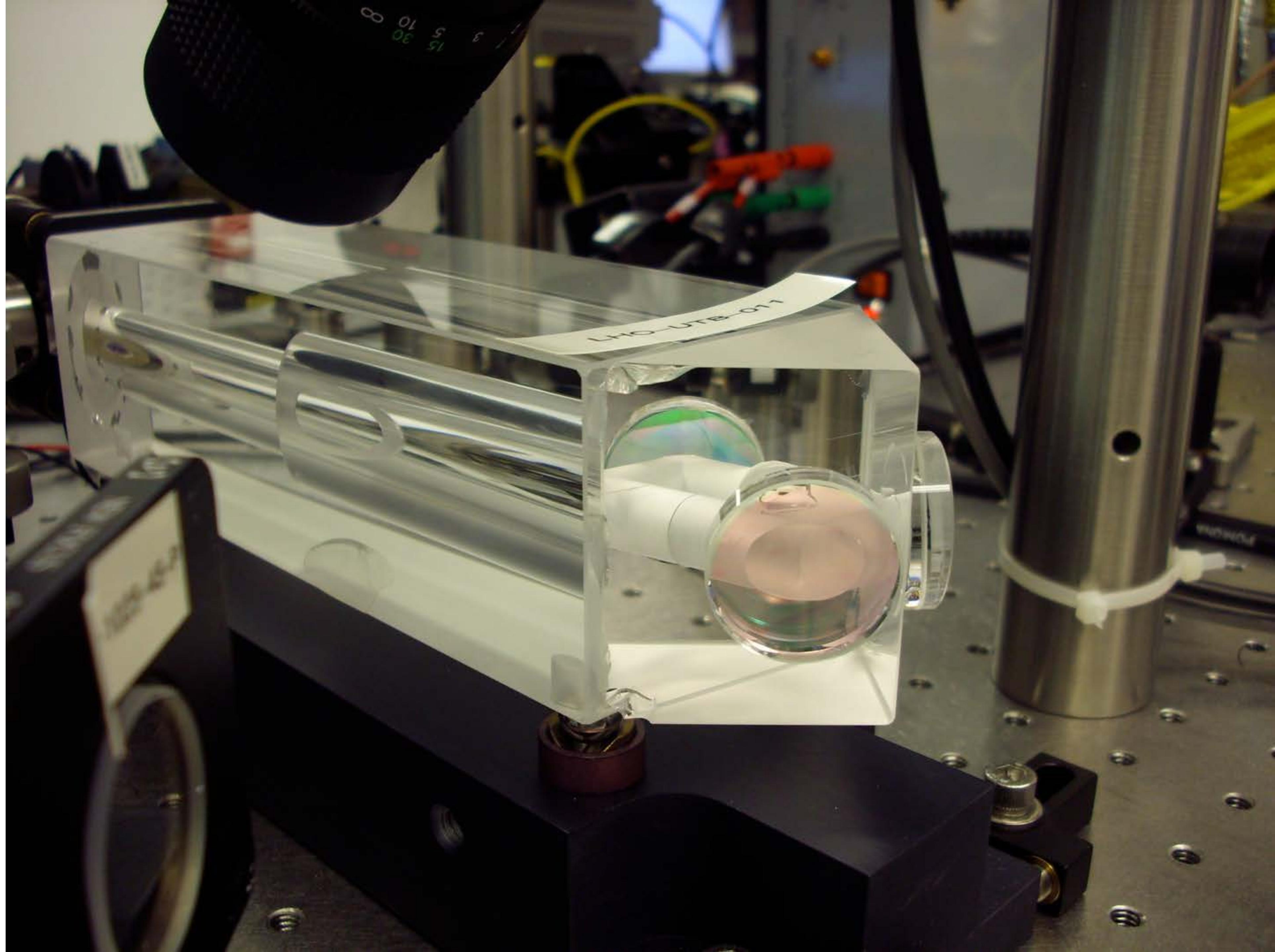










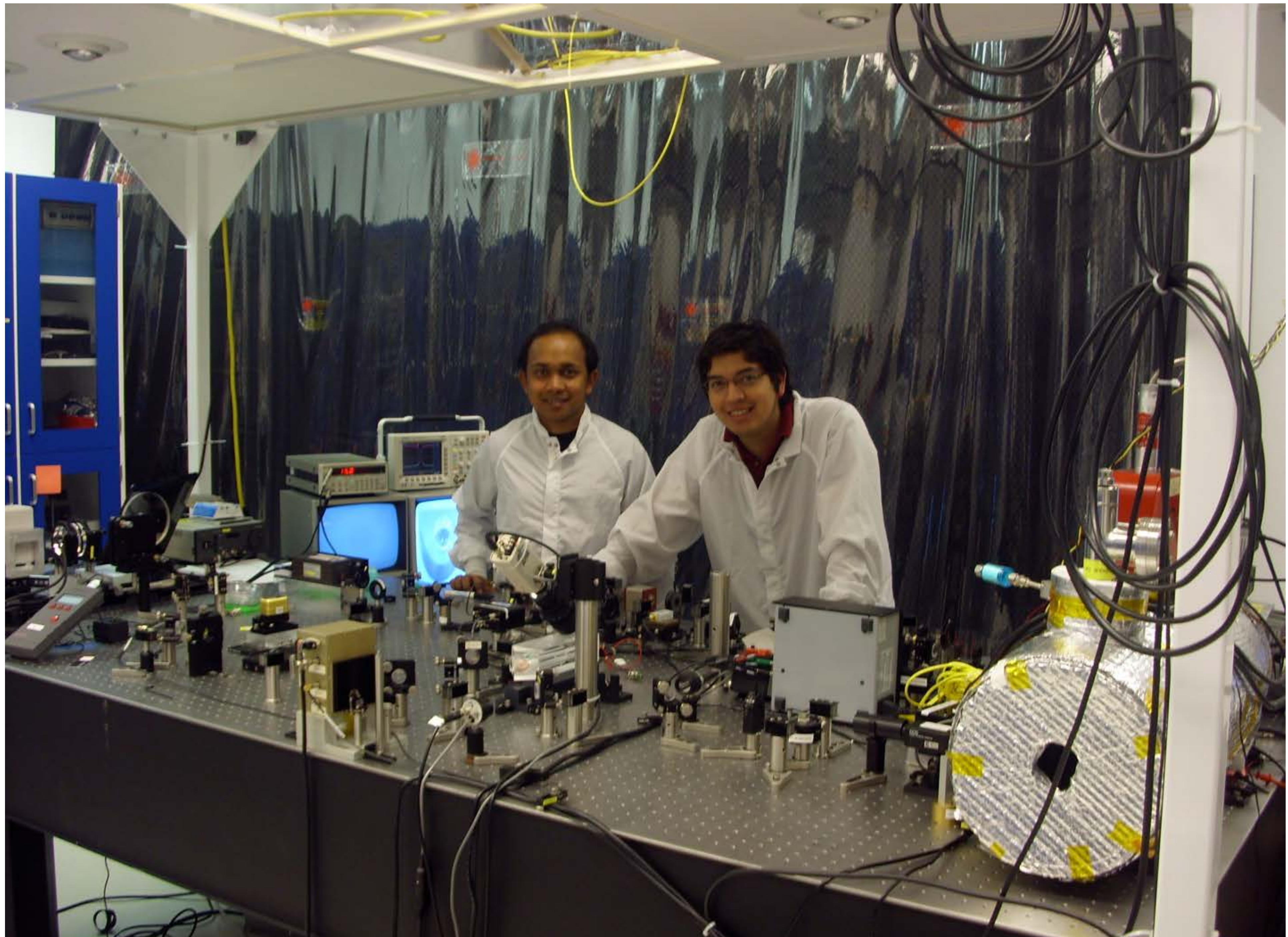












Collaboration to Integrate Research and Education between  
The University of Texas at Brownsville and The Laser Interferometer  
Gravitational-Wave Observatory

L. Cabeza, M. Díaz, F. Khan, J.D. Romano  
The University of Texas at Brownsville

M. Coles, A. Lazzarini  
Laser Interferometer Gravitational-Wave Observatory

*It may be that physicists in the twenty-first century will find that the study of black holes or gravitational radiation reveals more about the laws of nature than elementary particle physics.*

Steven Weinberg (*Dreams of a Final Theory*)

## 2 Project description

### 2.1 Organization of the collaboration

#### 2.1.1 The University of Texas at Brownsville

The University of Texas at Brownsville (UTB) is the newest component of the University of Texas system. Established by the state in 1992, UTB currently enrolls more than 9,000 students, of whom 89% are Hispanics, mainly of Mexican-American descent. As part of an ambitious expansion to better serve an underrepresented community, UTB received state approval three years ago to start new programs in Chemistry, Computer Science, Engineering Technology, and Physics. A new state-of-the-art building for housing these programs was completed a year ago. In the fall of 1996, Mario Díaz was hired to help to develop the physics program, and within the first year, about ten students joined the program.

Even though these programs are relatively new, a large number of students have enrolled in them. One hundred and eighty students are currently registered as Engineering Technology majors, and one hundred and twenty are registered in Computer Science. Some of the students are doing research with faculty as part of the Alliance for Minority Participation (AMP) program at UTB. AMP is a program funded by NSF and administered by the University of Texas system that seeks to increase the participation of minority and disadvantaged students in science-related careers. Díaz is the UTB campus director of AMP, and he has helped to attract local students to pursue scientific careers. This year eighteen students participated in research activities funded by AMP and NASA, under the direction of UTB faculty.

#### 2.1.2 The Laser Interferometer Gravitational-Wave Observatory

The Laser Interferometer Gravitational-Wave Observatory (LIGO) is one of the largest scientific projects currently supported by NSF [1]. The three LIGO detectors, currently in the process of being completed, will soon be joined by similar interferometric gravitational wave detectors in Pisa, Italy [2], Hannover, Germany [3], and Tokyo, Japan [4]. This world-wide network of gravitational wave detectors will allow researchers to study

# CALIFORNIA INSTITUTE OF TECHNOLOGY

LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY (LIGO) PROJECT  
CHARLES C. LAURITSEN LABORATORY OF HIGH ENERGY PHYSICS

May 19, 1999

Professor Joe Romano  
University of Texas  
Brownsville, TX

Dear Joe:

I am writing this letter in support of your proposal for a grant under the NSF's CIRE program (Collaborative to Integrate Research and Education). We are very enthusiastic about the effort you are initiating on LIGO at UTB.

As you are well aware, LIGO is a very ambitious undertaking by the NSF. We are nearing completion of our two observatories – one in Livingston, Louisiana and the other in Hanford, Washington. By early next year we expect to begin to turn on these large instruments and plan to begin our first science run in 2002. Your research has been valuable to our planning for doing science on LIGO and we expect your group to be important contributors to the future searches for gravitational waves.

In addition to the physics research that will be done on LIGO, we are committed to a strong education and outreach program. LIGO is an NSF REU site and we are proud to the program we have instituted involving undergraduates in our research. This summer we are also instituting a summer program for high school teachers and students. The program you are proposing would represent a significant step to also involve us in an integrated research program for minority students. We are committed to working with you on this important program.

Integrating research and teaching is important to the NSF and important to us on LIGO. Doing this for minority students is an important goal of our program. We hope to work jointly with you on your proposed program.

Sincerely,



Barry C. Barish  
Linde Professor of Physics  
Director, LIGO Laboratory

## 4 Proposed Center Description

### 4.1 Center for Gravitational Wave Astronomy

This is a proposal to create a NASA Group 3 OMU University Research Center (URC), the "Center for Gravitational Wave Astronomy" (CGWA), at The University of Texas at Brownsville (UTB).

This center will develop excellence in research and education in areas related to a new type of Astronomy which will become technically feasible within the next five to ten years, gravitational wave astronomy. This center will focus on the theoretical aspects of this type of astronomy, specifically astrophysical source modelling, gravitational wave data analysis, and the phenomenological astrophysics of gravitational wave sources, the first two of which UTB has already established world-class research programs in. It will also push forward existing programs at UTB in some associated areas of computational science, specifically parallel, distributed and grid computing methods. In accomplishing these research goals, UTB will naturally achieve the human resource development objectives of the URC program. The University of Texas at Brownsville is one of four public universities that serve the Texas-Mexico border region, and draws its student population almost exclusively from this region. UTB is therefore a Hispanic serving institution with a student body approximately 90% Mexican-American. By utilizing existing resources, including a doctoral program agreement with The University of Texas at Dallas, the proposed center will: (i) make substantial contributions to the Space Science NASA enterprise, (ii) improve the rates at which U.S. citizens of Hispanic descent are awarded advanced degrees in basic science at the master and the Ph.D. level at the local, state and national levels, (iii) increase the number of Hispanic undergraduates in the areas of physical sciences, computer science and engineering and (iv) augment the general scientific literacy of the lower Rio Grande region, thus providing a fertile environment for an increased high-tech component for border industries.

The center that we propose to create stems from an assessment of current existing resources, an understanding of the potential for the development of new programs, and a vision for graduate education. The existing resources which revolve around the UTB Relativity group (UTBRG), currently with five faculty, one post-doc and several undergraduate and graduate students, reached a "critical mass" after only six years of development. This rapid growth is due in large part to very strong support from UTB administration. The UTBRG has now gained national and international recognition. Its organization, its broad-ranging collaborations and its short but impressive history of funding indicates that it has achieved a level of maturity that will allow it to move to the next level: the creation of a center of excellence.

The research focus of the CGWA will draw heavily upon the expertise already in the UTBRG. Five CGWA investigators (Anderson, Campanelli, Díaz, Lousto and Romano) are listed in UTB's memorandum of understanding with the LIGO (Laser Interferometer Gravitational wave Observatory) Scientific Collaboration (LSC). In the area of data analysis, investigators Anderson, Díaz and Romano, together with undergraduate and graduate students and one post-doc, have contributed to the LSC's data analysis effort for three of the four gravitational wave source groups; they lead the effort for stochastic signals and have contributed to developing data analysis methods and implementing searches for unmodeled burst signals and binary inspiral signals. In source modeling, Campanelli and Lousto lead the Lazarus project, a multi-institutional collaboration which is trying to obtain the first reliable model of black hole collisions using numerical modeling techniques. The CGWA will augment this expertise by adding a third area which will complement the other



OFFICE OF THE PRESIDENT

THE UNIVERSITY OF TEXAS AT BROWNSVILLE and TEXAS SOUTHMOST COLLEGE

80 Fort Brown • Brownsville, Texas 78520 • (956) 544-8201 • Fax (956) 548-0020

Juliet V. García, Ph.D.  
President

May 16, 2002

Dr. Mario Díaz  
Chair, Department of Physics and Astronomy  
The University of Texas at Brownsville  
80 Fort Brown  
Brownsville, TX, 78520

Dear Dr. Díaz,

I am pleased to write this letter in strong support of your proposal to fund a NASA Group 3 OMU University Research Center for Gravitational Wave Astronomy at The University of Texas at Brownsville. As you are well aware, it is especially important to the future of young universities, such as ours, to create a nurturing environment in which the creativity and ambition of young faculty can grow and flourish. It is one of the primary goals of this administration to provide such an environment.

It is gratifying to see how successful the Department of Physics and Astronomy, which you chair, has been in recruiting dynamic young researchers. We are especially glad to see these young professors continuing your department's strong record of fostering our undergraduate and graduate students to participate in research at the very frontiers of your discipline.

The creation of the Center for Gravitational Wave Astronomy is a natural step in the evolution of your department, and a positive step forward for the University as we expand our horizons in the twenty-first century. Our administration will support the initiative to establish this center at UTB by every means possible working within the resources of our institution. In particular, we commit to the creation of two new tenure-track positions in the Department of Physics and Astronomy to participate in the activities of the center should it be funded. Furthermore, we are prepared to offer summer salary to the faculty of the center for the five-year duration of the initial granting cycle.

I wish you every success in this endeavor, and look forward to many more wonderful success stories from your department in the near future.

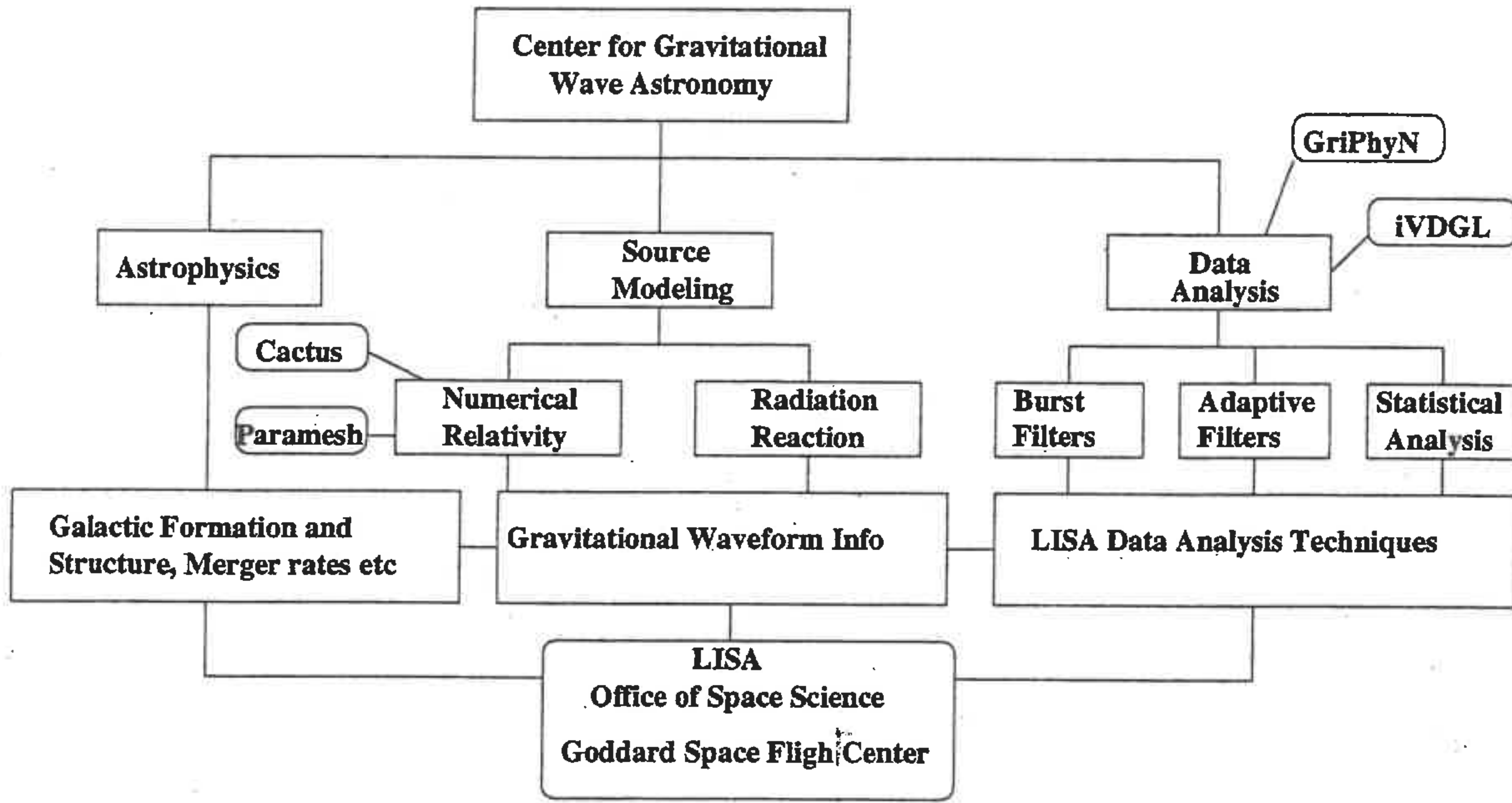
Sincerely,

A handwritten signature in black ink, appearing to read 'Juliet V. Garcia'.

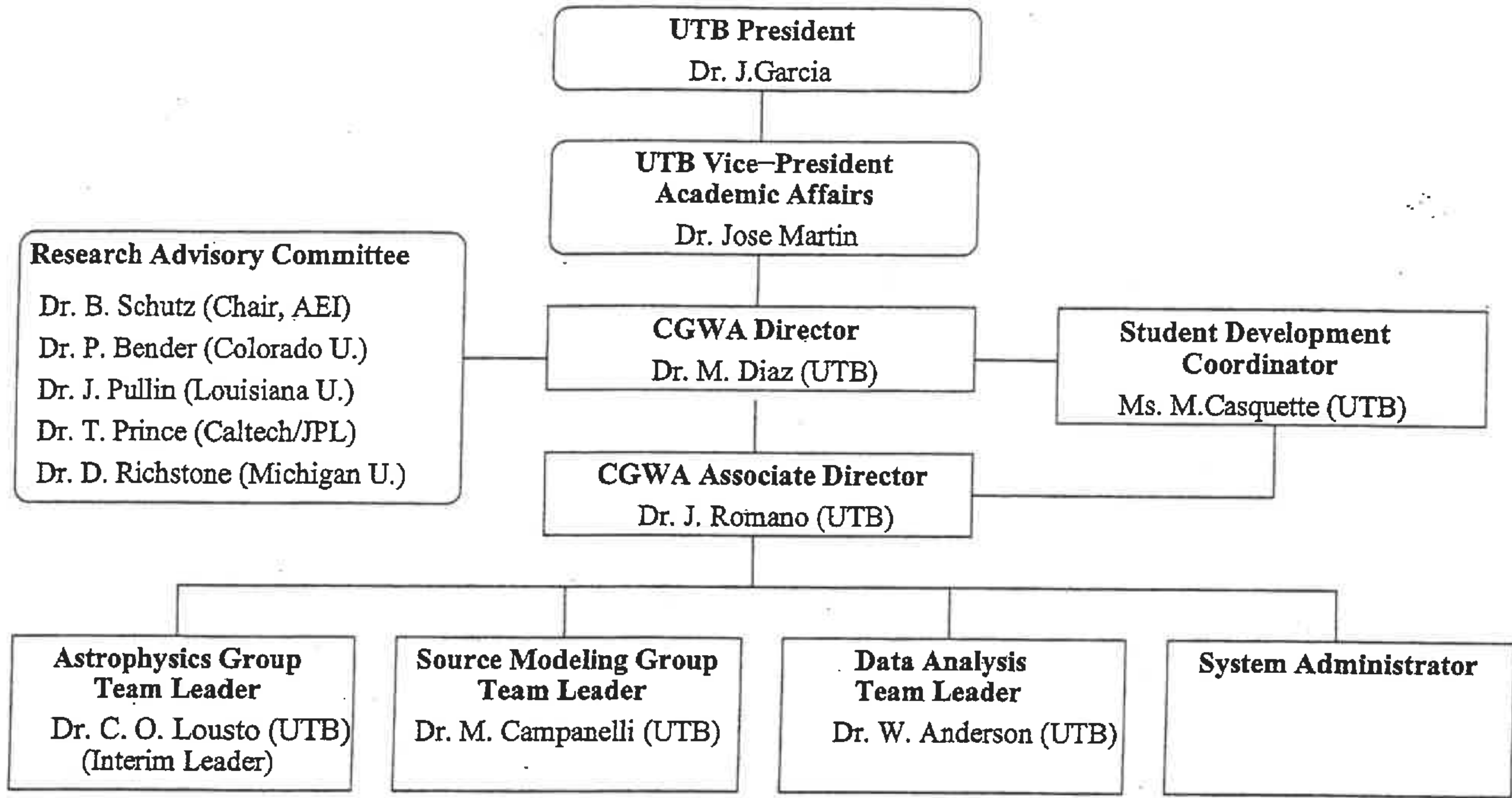
Juliet V. García



*From Left to right: Joseph D. Romano, Manuela Campanelli, Mario C. Diaz, Carlos O. Lousto and Warren G. Anderson collaborated on the award winning grant proposal to NASA.*



# CGWA Organization and Management Plan

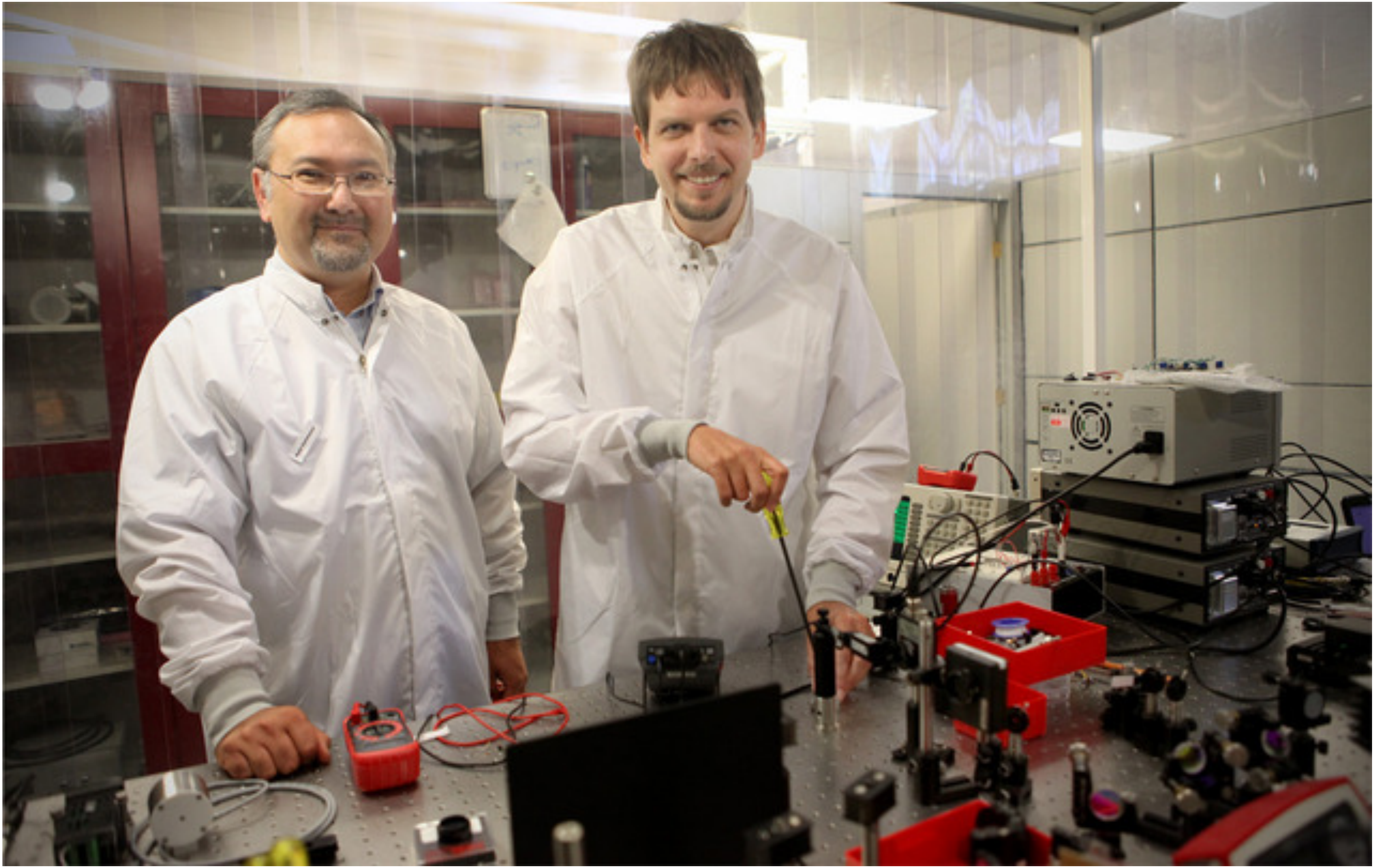




Welcome  
PARTICIPANTS















# Celebrating Space



Photography Exhibit | Mars as Art by NASA & CARA UTB

Art Exhibits | Spacetime by Sara Mast, Evolution by Emilio Rangel

& Inspiration by the Masters, Dalí, Miró, Tamayo, Velazquez & Matta

Art Installation | Black (W)hole by Einstein Collective & CGWA UTB

Sculpture Exhibit | Quantic by Sebastián



**Nov. 2014 - May 2015**

**CELEBRATION** OF THE  
**10<sup>TH</sup>** ANNIVERSARY  
OF THE **CENTER FOR**  
**GRAVITATIONAL**  
**WAVE ASTRONOMY**

*The physics is theoretical, but the fun is real!*

**3 p.m. • Oct. 12, 2013**

**Student Union**

**Food, Music, Activities, Fun • Free of charge**

Activities include a black hole art installation, a one ring science “circus”, telescopes for solar viewing, talks by leading research scientists, and artistic media such as an original film on black holes.



Center for Gravitational Wave Astronomy  
Department of Physics and Astronomy  
Calvary C210 • 956-882-6765 • [utb.edu/physics](http://utb.edu/physics)













# LIGO

Hanford  
Observatory





**Rio Grande Science and Arts Festival**

**The University of Texas at Brownsville**

**November 6-9, 2014**

The Laser Interferometer Space Antenna (LISA) is a NASA project that will detect gravitational waves that pairs of supermassive black holes emit as they revolve around each other.

Pulsars are spinning neutron stars that stream particles out of its poles.

When galaxies collide the super massive black holes at their centers which are millions of times as massive as the sun to revolve around each other.

A neutron star is one way a massive star ends. They are extremely dense and have an immense gravitational field. Neutron stars can pair up and revolve around each other, emitting gravitational waves.

The Milky Way Our galaxy is a massive black hole supermassive black hole.

# SPACE, The Final Frontier



